

PROGRAM DISPLAY AND SELECTING APPARATUS,
DIGITAL BROADCAST RECEIVER AND
DIGITAL BROADCAST RECEIVING SYSTEM

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BACKGROUND OF THE INVENTION

Technical Field

10 The present invention relates to a program display and
selecting apparatus for displaying an electronic program
guide (EPG) contained in a digital broadcast and for
selecting a program to be monitored, a digital broadcast
15 receiver for transmitting an EPG to the program display
and selecting apparatus, and a digital broadcast
receiving system comprising the program and selecting
apparatus and the digital broadcast receiver.

Prior Art

20 In analog broadcasting, only one channel can be allotted
to one frequency band, whereas a plurality of channels
can be allotted to one frequency band in digital
broadcasting. Therefore, digital broadcasting can
25 realize a multi-channel system more easily than analogue
broadcasting. Digital broadcasting now includes
communications satellite (CS) broadcasting, cable
broadcasting, Internet broadcasting, and the like. All
the receivers for these broadcastings are of set-top box
30 type, as shown in Fig. 6. The set-top box 90, which is
an apparatus connected to a television monitor 70, has a
function of receiving and conversing image signal and a

connecting interface for connecting with a telephone circuit or a personal computer.

The digital broadcast receiver 90 shown in Fig. 6 includes a digital input (receiving cable 96), a television output (output cable 74) and a remote control interface (I/F) (receiving unit 108). A program selected by a user from among the broadcast programs input through the output cable 74 is outputted on the monitor screen 72 of the television 70 through the output cable 74. A program is selected through the use of infrared remote control apparatus 92 having a transmission unit 118, or by operating buttons on the main body of the receiver 90.

In digital broadcasting represented by CS broadcasting, cable broadcasting and the like, such data as image, sound and compute program is compressed in accordance with Moving Picture Expert Group Phase 2 (MPEG2), and the mixed data is transmitted in accordance with MPEG2-TS (transport stream). The MPEG2-TS contains the electronic program guide called EPG, in addition to the program.

As shown in Fig. 7, the digital broadcast receiver 90 includes:

a tuner unit 64 for receiving data;
an MPEG2 transport demultiplexer 62 for transmitting the program data from the tuner 64 to an MPEG2 decoder and image processor 102 and for transmitting EPG information (program table) to a microprocessor unit (MPU) 104;

an MPEG2 decoder and image processor 102 for obtaining the program image and sound data from the received MPEG2 data as well as for synthesizing the EPG information processed by the MPU 104 with the program data; and

an NTSC (National Television System Committee) encoder and audio 68 for outputting the program data and the EPG information to the television 70.

The program data is received by the tuner unit 64 and then transmitted as a digital data to the MPEG2 transport demultiplexer 62. The program image and sound data are transmitted from the transport demultiplexer 62 to the NTSC encoder and audio 68 through the MPEG2 decoder and image processor 102 and then outputted to the television 70 as an analog image and sound output.

The EPG information is, as shown in Fig. 8, transmitted from the transport demultiplexer 62 to the MPU 104 (arrow A in Fig. 8). After being processed by the MPU 104, it is transmitted to the MPEG2 decoder and image processor 102 (arrow B in Fig. 8). After being subjected to image processing, it is displayed on the television monitor screen 72.

The digital broadcast receiver 90 including an infrared interface 106 and the infrared receiving unit 108, which are connected to the MPU 104, can receive a signal from the remote control apparatus 92 and input the signal to the MPU 104. A program channel displayed on the television 70 is selected by controlling the demultiplexer 62 by the MPU 104. Also, the program table

is switched on or off by controlling the MPEG2 decoder and image processor 102 by the MPU 104.

As shown in Fig. 7, the remote control apparatus 92 includes a switch button 112, a switch button interface 114, an infrared transmitting unit 118 and an infrared interface 116 for transmitting the input switch button information to the receiver unit 90. When the switch button is pressed, the input information is transmitted to the MPU 104 of the receiver 90.

For example, when a remote control apparatus 92 is equipped with switch buttons corresponding to the channel numbers and one of the buttons is pressed, the information of the pressed button is transmitted to the MPU 104. The MPU 104 controls the transport demultiplexer 62 (arrow A in Fig. 9) and switches the program to be received by the tuner 64 to a channel corresponding to the pressed button.

For further example, when the switch button for switching the program table display on/off on the remote control apparatus 92 is pressed in the non-display status of the program table, the information that a button has been pressed is transmitted to the MPU 104. The MPU 104 transmits an EPG information (arrow B in Fig. 9) to the MPEG2 decoder and image processor 102 and displays the program table after image processing the information.

The EPG (program table) includes informaton concerning a broadcasting program such as channel number, channel name, program name, date of a program, start time of a

program, program code, program description and so on.
For example, as shown in Fig. 11 to Fig. 13, such
information as messages and program tables are provided
to the users by displaying the information of each
program in the program frames 82 and 84 and by displaying
a description for the selected program 84 in the
description frame 86. Referring to the EPG information
78 displayed on the monitor screen 72, the users are able
to select a program to monitor with the remote control
apparatus 92.

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A monitor screen for EPG display is used to display an
EPG information 78, or the EPG information 78 may often
be superposed on a program image 76. However, in these
cases, almost all the area of the monitor screen 72 is
occupied by the EPG information 78. To describe patterns
for EPG display more precisely, for example, Fig. 10
shows a program image 76 before displaying an EPG
information. In Fig. 11, the EPG information 78 is
displayed on a full screen. In 12, the EPG information
78 is superposed on the program image 76, and in Fig. 13,
the program image 76 is displayed on the compressed
monitor frame 88.

In the case of displaying the EPG information 78 on a
full screen 72 of the television 70 as shown in Fig. 11,
only the EPG information 78 is displayed on the screen,
so that the program image 76 in the receiving cannot be
monitored. Unlike the above case in Fig. 11, in the case
of displaying the EPG by superposing the EPG 78 on the
program image 76 as shown in Fig. 12, only a small part
of the program image 76 in the receiving can be monitored

from between the gaps of the program table 78. However, the program image 76 can hardly be monitored sufficiently. In some cases, the EPG information may be superposed on the program image 76 as a translucent or see-through image through which the program image 76 can be seen. However, again, although it is possible to monitor the program image 76 between the gaps and through the translucent EPG image, it is hard to monitor the program. Also, since the program image 76 is visible through the program table 78, it is hard to read the characters on the program table 78.

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In the case of Fig. 13, the image 76 being received is compressed and displayed in a part of the monitor screen 72 of the television 70 (compressed monitor screen 88) and the EPG information 78 is displayed in the remaining area of the monitor screen. Since the program image 76 is compressed, the image 76 of Fig. 13 is inferior to the normal image shown in Fig. 10. As described above, when the EPG information 78 is displayed on the television monitor screen 72, the users are interrupted in monitoring a program or made it hard to monitor a program.

The digital broadcast receiver receives the EPG information for channels in the same frequency band as that currently being received once every 10 seconds and the EPG information for channels in different bands from the current band once every 30 seconds. Therefore, for example, assuming that there are 200 channels and 4 channels are included in one frequency band and that frequency or channel is changed to capture the EPG for

the 200 channels (4 channels x 50 bands) sequentially,
one channel for each band, it will take 10 seconds x 50 =
500 seconds (8 minutes and 20 seconds), 10 seconds per
band. In order to capture the EPG information for the
200 channels, one channel for each band, without changing
the frequency or channel, it will take 30 seconds x 50 =
1500 seconds (25 minutes) 30 seconds per band.

In the case of an actually-commercialized CS receiver,
whenever a screen displaying EPG information is scrolled,
it is necessary to capture new EPG information to display
again after scrolling. Therefore, if the screen is
scrolled while EPG information is being obtained one
after another under the same conditions described above,
it will take a maximum latency of 10 seconds for one row
(for one channel). Thus, if EPG information is received
every time it is displayed on a television screen, it
takes longer time to display and renew the information
and it is impossible to provide the newest EPG
information constantly to users.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a
digital broadcast receiving system having a program
display and selecting apparatus and a digital broadcast
receiver, which can display a program table (or EPG)
without preventing the monitoring of a program image,
provide a means for directly selecting a program to be
monitored, and further provide the newest program tables
constantly to users.

An essential part of the digital broadcast receiver of the present invention is to include a transmitting means for transmitting the EPG data contained in a received digital broadcast data. An essential part of the program display and selecting apparatus of the present invention is to include a receiving means for the EPG data transmitted from said digital broadcast receiver and a displaying means for displaying the received EPG data.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the present invention will now be described by way of example only, with reference to the accompanying drawings in which:

Fig. 1 is a perspective view illustrating an outline of a program display and selecting apparatus, and a digital broadcast receiver according to the present invention.

Fig. 2 is a block diagram showing a structure of the program display and selecting apparatus, and the digital broadcast receiver shown in Fig. 1.

Fig. 3 is an enlarged view of the program display and selecting apparatus shown in Fig. 1.

Fig. 4 is a block diagram illustrating a flow of an EPG information through the program display and selecting apparatus shown in Fig. 1.

Fig. 5 is a block diagram illustrating a flow of a program selecting information through the program display and selecting apparatus shown in Fig. 1.

5 Fig. 6 is a perspective view illustrating an outline of a conventional remote control apparatus and a digital broadcast receiver.

10 Fig. 7 is a block diagram showing a structure of the remote control apparatus and the digital broadcast receiver shown in Fig. 6.

15 Fig. 8 is a block diagram illustrating a flow of EPG information through the remote control apparatus and the digital broadcast receiver shown in Fig. 6.

20 Fig. 9 is a block diagram illustrating a flow of a program selecting information through the remote control apparatus and the digital broadcast receiver shown in Fig. 6.

25 Fig. 10 is a partially enlarged view showing an example of a monitor screen displaying a program image on the television shown in Fig. 6.

Fig. 11 is a partially enlarged view showing an example of a monitor screen displaying a program table on the television shown in Fig. 6.

30 Fig. 12 is a partially enlarged view showing another example of a monitor screen displaying a program table on the television shown in Fig. 6.

Fig. 13 is a partially enlarged view showing still another example of a monitor screen displaying a program table on the television shown in Fig. 6.

5 **DETAILED DESCRIPTION OF THE PREFERRED**
 EMBODIMENTS OF THE INVENTION

Referring now to the accompanying drawings, embodiments of broadcast receiving system including a program display and selecting apparatus and a digital broadcast receiver are described below. Fig. 1 shows a program display and selecting apparatus 10 and a digital broadcast receiver 50 according to the present invention. The program display and selecting apparatus 10 comprises a liquid crystal display (LCD) 12 and an infrared transmitter-receiver unit 14. The digital broadcast receiver 50 comprises an infrared transmitter-receiver unit 58. The transmitter-receiver units 14 and 58 comprise a transmitter element and a receiver element, respectively (not shown).

Fig. 2 is a schematic block diagram showing a structure of the program display and selecting apparatus 10 and the digital broadcast receiver 50. The digital broadcast receiver 50 comprises a memory 54 for storing EPG information processed by an MPU 52, a transmitter-receiver unit 58 and an infrared interface 56, which transmit data to and receive data from the program display and selecting apparatus 10. Further, like a conventional digital broadcast receiver, the digital broadcast receiver 50 comprises a tuner unit 64, an MPEG2 transport demultiplexer 62, an MPEG2 decoder 66 for obtaining image and sound data from received MPEG2 data,

and NISC encoder and audio 68, and it is connected to a receiving cable 96 and an output cable 74.

5 The program display and selecting apparatus 10 comprises a transmitter-receiver unit 14 and an infrared interface 26 which transmit data to and receive data from the digital broadcast receiver 50, an MPU 22, a memory 28 for storing EPG information transmitted from the digital broadcast receiver 50 and an LCD 12 for displaying EPG
10 information. The screen surface of the LCD 12 is a touch panel which allows users to manipulate input operation with a pen or finger. Thus, a program to be monitored can be selected through the touch panel.

15 Fig. 3 is a front view of the program display and selecting apparatus 10. A program table 78, operation marks 44 and 46, a present time line 42 indicating present time and the like are displayed on the LCD screen 12. The program table 78, for example, includes program
20 frames 82 and 84 which indicates content of program on each channel, and a description frame 86 which displays a program description of a selected channel 84. The operation marks 44 and 46 allow the users to scroll up or down the program frames 84 and 82 by touching the mark 44 or 46, for example. In addition, the program display and
25 selecting apparatus 10 can be equipped with operation buttons 32, 34 and 36. For example, these operation buttons can be push button type switches. In this case, the power may be turned on/off by pressing button 32, the sound output level of television image may be reduced by
30 pressing button 34, and sound output level may be increased by pressing button 36.

Next, a functional description of the program display and selecting apparatus when a program is monitored by using the apparatus is given below. Like in the conventional manner, program data is transmitted to the television 70 through the tuner unit 64, the MPEG2 transport demultiplexer 62, the MPEG2 decoder 66 and the NTSC encoder and audio 68.

As shown in Fig. 4, EPG information is transmitted from the transport demultiplexer 62 to the MPU 52. After being processed by the MPU 52, the EPG information is stored temporarily in the memory 54. The EPG information stored in the memory 54 is transmitted from the digital broadcast receiver 50 to the EPG display and selecting apparatus 10 through the infrared I/F 56 and the infrared transmitter-receiver unit 58, after it is further processed or as it is. The EPG information is transmitted whenever the digital broadcast receiver 50 receives a newest EPG information. Further, since the program displayed selecting apparatus 10 is not always ready to receive the EPG information, the digital broadcast receiver 50 repeats the transmission of the EPG information periodically.

In the program displayed selecting apparatus 10, the EPG information is received by the infrared transmitter-receiver unit 14 and the infrared I/F 26. The receiver EPG information is transmitted to and stored in the memory 28 through the MPU 22. Then, the EPG information (program table) stored in the memory 28 is transmitted through the MPU 22 again and displayed on the LCD monitor screen.

When selecting a program to monitor, a user can select a desired program by touching the LCD monitor screen (touch panel) 12 with his/her finger. Information of the selected program is transmitted from the touch panel to the MPU 22 through the touch panel I/F 24 as shown in Fig. 5. Then, the information of the selected program is further transmitted from the infrared I/F 26 and the infrared transmitter-receiver unit 14 to the digital broadcast receiver 50.

In the digital broadcast receiver 50, the information of the selected program received by the infrared transmitter-receiver unit 58 and the infrared I/F 56 is transmitted to the MPU 52. The MPU 52 controls the transport demultiplexer 62 and switches a program received by the tuner 64 to the selected program.

As described above, the program displayed and selecting apparatus 10 comprising a display means eliminates the need for displaying EPG information on the television monitor screen 72, therefore, users are not prevented from monitoring a program. Furthermore, periodical transmutation of EPG information enables users to obtain EPG information constantly. Especially in the conventional manner, whenever EPG information is displayed on the television monitor screen 72, EPG information has to be received, therefore, it takes a considerable period of time to renew the display. However, by using the apparatus 10 of the present invention, the latest EPG information can always be displayed. Furthermore, a user can directly select a program displayed on the television 70 among the EPG

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information displayed on the touch panel 12 by touching the panel 12 with his or her finger.

5 Having described the preferred embodiments of the present invention, it should be understood that the program display and selecting apparatus, the digital broadcast receiver and the digital broadcast receiving system according to the present invention can also be materialized in the other embodiments. For example, data
10 transmission between the program displayed and selecting apparatus and the digital broadcast receiver can be replaced with a data transmission with an IR-Bus (excepting infrared rays), a radio (radio wave) or the like. Further, the operation means (or touch panel) for
15 operating the digital broadcast receiver is not limited to selecting a channel, but it can also make a program reservation.

20 Based on the accompanying drawings, practical embodiments of the program display and selecting apparatus, the digital broadcast receiver and the digital broadcast receiving system according to the present invention have been described above, however, the present invention is not limited to the illustrated program display and
25 selecting apparatus and the digital broadcast receiver. For example, the operating means is not limited to the touch panel. Operation keys or a pointing device such as a joy stick, a mouse or the like can be used as the operating means. Further, the program display and
30 program selection may also be performed by using a personal computer equipped with an IR (infrared) transmitter-receiver interface. Accordingly, it will be

apparent to those skilled in the art that various changes, improvements, and modifications can be made thereto without departing from the spirit or scope of the invention.

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According to the program display and selecting apparatus, the digital broadcast receiver and the digital broadcast receiving system of the present invention, using a program display and selecting apparatus which can communicate with a digital broadcast receiver, EPG information can be displayed on the apparatus while a program is monitored. In addition, the newest EPG information (program table) can always be provided to users. Furthermore, a desired program display and selecting apparatus with a pen or a user's finger.

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While the invention has been particularly shown and described with respect to preferred embodiments thereof, it will be understood by those skilled in the art that the foregoing and other changes in form and detail may be made therein without departing from the spirit and scope of the invention.

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